MASTER

XXIV

# Report on Wind Observations at Stockbridge House E.H.S., Cawood, Selby, Yorks

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1. Introduction: After consultation with Mr. R. W. Gloyne (Met. Office), a wind-break of mixed species was planted along part of the South and West boundaries of the station in 1950-51 (see Fig.1). The cup counter anemometer at the old weather station is some 900 feet from this shelter belt (site I), and an instrument for comparison was set up some 75 feet from the belt, with maximum protection from the S.W. but some protection from E.S.E. to N.W. (site II). Daily records have been taken from these instruments since May 1952. Since that date the trees have grown to a height of some 20 ft., increasing the shelter at the nearer anemometer. At the same time a number of glasshouses and other buildings have been erected near the weather station, interfering with air-flow and probably producing some shelter effect there. In November 1958 a second weather station was set up some 1,600 ft. to the North to avoid the effects of these obstructions (site III). The positions of these instruments are marked on Fig.1.

2. Object of Report:

2.1. To examine the wind-records in order to determine the effect of increasing shelter near the wind-break.

2.2. To advise on the frequency of future anemometer readings.

3. Effect of increasing shelter:

3.1. The monthly runs-of-wind near the wind-break (II), and at the weather station (I) have been used to compute the relative shelter near the wind-break. Relative shelter is defined as follows:-

$$100X\left(1-\frac{\text{Run of wind near shelter-belt}}{\text{Run of wind at weather station}}\right)$$

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1952 | | | | | 12 | 10 | 7 | 4 | 10 | 9 | 10 | 3 |
| 1953 | 3 | 1 | 2 | 2 | 7 | 3 | 9 | 9 | 2 | 7 | 6 | 1 |
| 1954 | 2 | -3 | 0 | 7 | 7 | 9 | 7 | 2 | 11 | 8 | -2 | 8 |
| 1955 | 3 | 0 | 2 | 9 | 9 | 4 | 7 | 19 | 31 | 13 | 3 | 10 |
| 1956 | 7 | -3 | 3 | 5 | 14 | 13 | 19 | 22 | 16 | 18 | 12 | 22 |
| 1957 | 21 | 15 | 13 | 8 | 14 | 16 | 25 | 18 | 18 | 32 | 19 | 23 |
| 1958 | 16 | 15 | 2 | 17 | 13 | -2 | 21 | 29 | 18 | 25 | 16 | 22 |
| 1959 | 19 | 28 | 14 | 23 | -1 | | | | | | | |

In general, the relative shelter has increased in each month during the period of observation, but the increase has been by no means regular, mainly because of variations in wind direction. It seems likely that the relative shelter would have increased still more if buildings had not been put up near the weather station.

3.2. The wind-break was designed to give protection mainly from the W. and S.W. In order to test the effects from these general directions, comparisons have been made during periods when the wind direction at the weather station was between S. and N.W. Summer and winter periods were used in each year as some trees are deciduous. The values of relative shelter are given below:-

| | SUMMER | | | WINTER | | |
|---|---|---|---|---|---|---|
| | Period | Direction | R.S. | Period | Direction | R.S. |
| 1952 | 27.5.52-11.6.52 | SW-NW | 8 | 15.1.53-31.1.53 | SW-NW | 4 |
| 1953 | 4.7.53-30.7.53 | SW-W | 10 | 6.1.54-20.1.54 | SW-NW | 3 |
| 1954 | 20.7.54-3.8.54 | SW-W | 11 | 17.12.54-28.12.54 | W | 11 |
| 1955 | 3.5.55-23.5.55 | SW-NW | 11 | 11.1.56-22.1.56 | SW-NW | 14 |
| 1956 | 12.8.56-29.8.56 | SW-NW | 24 | 19.1.57-1.2.57 | S | 29 |
| 1957 | 13.7.57-31.7.57 | S-NW | 26 | 4.1.58-19.1.58 | S-NW | 21 |
| 1958 | 26.7.58-6.8.58 | SW-NW | 46 | No suitable period | | |

The gradual increase in the influence of the wind-break is obvious. As would be expected, the wind-break tends to be more effective in summer than in winter but the results are not quite consistent.

3.3. Records are now available for six complete months from the new weather station (III). This station is considerably more exposed that the old. The following table gives the relative shelter at the old station (I) and at the anemometer near the wind-break (II), expressed in terms of the wind at the new station (III).

| | 1958 Dec. | 1959 Jan. | Feb. | Mar. | April | May |
|---|---|---|---|---|---|---|
| Old Station (I) | 25 | 24 | 25 | 22 | 23 | 28 |
| Wind-Break (II) | 41 | 39 | 46 | 33 | 40 | 27 |

It is clear from the first line that the site of the old weather station is now a poor one, and the run-of-wind is some 25% less than in a well-exposed position. It follows from this that the relative shelter near the wind-break has been underestimated. As building had been going on since 1951, no doubt the errors in the estimation of the shelter effect of the wind have gradually increased. The figures above suggest that true relative shelter near the wind-break is now some 40%.

4. Needs for future readings:-

4.1. At present the belt is some 20 ft. high and the anemometer is 75 ft. from the belt, which can be taken as 4 h. With a medium density wind-break, the point of greatest relative shelter is not likely to be more than 4 h. from the trees.

If a constant density for the belt could be assumed, the probable effect of the growth of trees could be to increase slightly the relative shelter at the present anemometer site for some years, this increase might then be followed by a decrease if the trees reached more than about 40 ft. However, it is unlikely that the differences would be easily detectable owing to variations in density with growth and thinning.

4.2. Ideally, the increasing effect of a shelter-belt can best be shown by a number of strategically placed instruments. This is impossible here because of buildings, and a useful compromise would be to move the present instrument to say 8 h. from the belt, i.e. to a point about 160 ft. from the inner edge of the trees. An increase in relative shelter would be expected at this point until the trees were 40-50 ft. high.

4.3. There is no necessity to continue daily observations. One period of, say, 10 days or longer with winds from between S. and N.W. in summer and winter would give enough comparison with the unobstructed wind (from the new weather station). During each period daily observations of run-of-wind should be recorded. At the end of the period a comparison should be made to see whether the results appear reasonable - if not, another run should be made as soon as possible.

Some forecast guidance from the M.O. will be needed but this should create no difficulty. It would probably also be more satisfactory if M.O. examined records as soon as they are made, to decide whether any repetion is necessary.

5. Summary and Conclusions.

5.1. The relative shelter at about 4 h. from the wind-break is now some 40%.

5.2. The anemometer near the wind-break should be moved to about 8 h.

5.3. Once in each summer and winter daily values of run-of-wind should be recorded from the 8 h. point for at least 10 days when the wind is from suitable directions.

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National Agricultural Advisory Service, Bristol.
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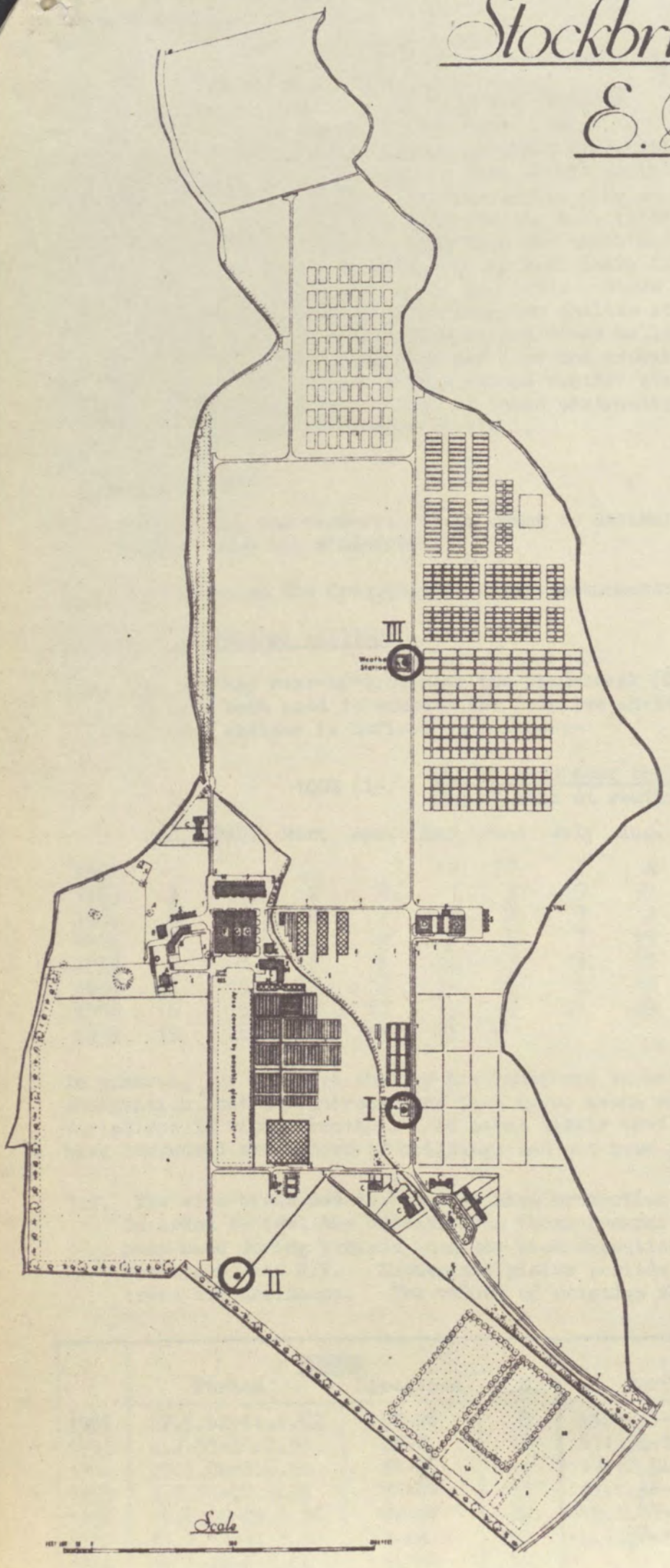
# Stockbridge House
# E.H.S.



## REFERENCE

### INDEX TO BUILDINGS

| | | | |
|---|---|---|---|
| A | Director's House | Implement Shed | J |
| B | Office Block | Boiler House | K |
| C | Farm Cottages | Soil Storage | L |
| D | Stores | Potting Shed | M |
| E | Messroom & Stores | Propagating House | N |
| F | Packing Shed | Stock Yard | O |
| G | Rhubarb Shed | Grain Drying Plant | P |
| H | Garage & Joiners Shop | Dutch Barn | S |

### SYMBOLS

| | | | |
|---|---|---|---|
| Concrete Roads | | Shrubbery | |
| Cinder & Hardcore | | Surveyed Trees | |
| Ditches | | Fruit Trees | |
| Hedges | | Spindle Apples | |
| Experimental Plots | | Raspberry | |
| Glasshouses | | Gooseberry | |
| Dutch Lights | | Redcurrant | |
| Shelter Belt | | Blackcurrant | |

### ABBREVIATIONS

| | |
|---|---|
| Power Poles | |
| Telegraph Poles | |
| Anemometer | |
| Sun Recorder | |
| Wind Direction | |
| Reservoir | |
| Pump House | |

Fig. 1